**Maintenance Analysis Procedures** 

IBM Mag Card Composer

## INTRODUCTION

This Maintenance Analysis Procedures Manual is produced for US and World Trade customer engineers and other service personnel. The purpose of this manual is to assist service personnel in diagnosing failures on the IBM Mag Card Composer.

Service personnel using this manual must have completed the student training course or understand the theory of operation as explained in the service manual Form No. 241-6046-0, which should be used with this manual.

## IBM MAG CARD COMPOSER **MAINTENANCE ANALYSIS PROCEDURES** TABLE OF CONTENTS

START OF CALL Map 0010 - Start Of Call

POWER SUPPLY START

Map 6000 – Power Supply Start
Map 6010 – Power Supply
Map 6020 – Power Supply A.C. Checks
Map 6030 – Power Supply
Map 6040 – Power Supply
Map 6040 – Power Supply D.C. Tolerance Diagnostics

	•		
			(

```
start of call
```

map0010

PAGE 1 OF 2

ENTRY POINTS | ENTER THIS MAP -----+--I ENTRY PAGE MAP

NUMBER | POINT NUMBER NUMBER No entries in this table

001 \*\*\*\*\*\*\*\*\*START\*\*\*\*\*\*\*

- -Discuss the problem or failure symptom with the operator.
- -Request a sample and/or any other information about the problem.
- -After obtaining the information from the operator, make a visual inspection for obvious defects (loose or broken parts, etc.)
- -If the cause of the failure can EASILY be determined (Step 001 continues)

EXIT PO	INTS		
EXIT TH	IS MAP	l TO	
PAGE NUMBER	STEP NUMBER	MAP   NUMBER	ENTRY POINT
1	002	6000	A
1	004	6010	Α
2	008	6010	Α

(Step 001 continued) repaired, repair as required and verify the fix.

-Turn the power off and then on.

Do all the motors and fans (printer and card deck motor and printer and power supply fan) run? Y N 1 002 GO TO MAP 6000, ENTRY POINT A. 003

Did the card deck "Click" when power was applied? Y N

004 GO TO MAP 6010, ENTRY POINT A.

```
start of call
Α
            map0010
            PAGE
                   2 OF
005
-Ensure that the "ENTRY" button
  is up and that there is not a
  card in the console.
-Depress several characters.
Did all the characters print?
Y N
 006
          "Remove Card"
  Is the
                          message
  on?
I Y N
    007
    -Check the voltages at the
      following planar, and the
      printer DC disconnect
      connections.
                      Voltage
       Connector-
       Pin Number
                       +24VDC
         1-12
         1-23
                       + 9VDC
         2-13
                       + 5VDC
                       - 5VDC
         2-16
         4-03
                       + 5VDC
         4-22
                       + 9VDC
         DC-1
                       +12VDC
         DC-2
                       + 9VDC
         DC-3
                       +24VDC
     (Step 007 continues)
```

```
(Step 007 continued)
         the voltages correct
   within a 10% tolerance?
   Y N
     008
     GO TO MAP 6010,
     ENTRY POINT A.
   009
   -The problem is likely to be
     in the printer. Go to the
     Printer Function chart for
     the last machine operation
     which occurred, if known.
     If this is not known, go to
     the Planar Static Voltage
     Check.
 010
 -The card deck is "busy".
   to the Load Function chart
   for the card deck.
011
-Go to the Quick Check for more
 information about the problem.
```

B C

```
MAP 6000
```

PAGE 1 OF 5

ENTRY POINTS FROM | ENTER THIS MAP MAP I ENTRY PAGE STEP NUMBER | POINT NUMBER NUMBER 0010 | A 1 001 001 (ENTRY POINT A) \* - POWER ON. supply Does the power operate? Y N

- Using the CE ohm meter on the

lowest OHMS scale, check the

EXIT POINTS EXIT THIS MAP PAGE STEP MAP ENTRY NUMBER NUMBER | NUMBER POINT 037 | 6010 Α

(Step 002 continued)

Does the meter indicate zero ohms across the fuse? Y N 003

- POWER ON.

Does the power supply fan operate? ΥN

1 004 - POWER OFF.

- Replace the fuse.

- Using the CE ohm meter on the lowest OHMS scale, check the MAIN LINE fuse.

Does the meter indicate zero ohms across the fuse? Y N

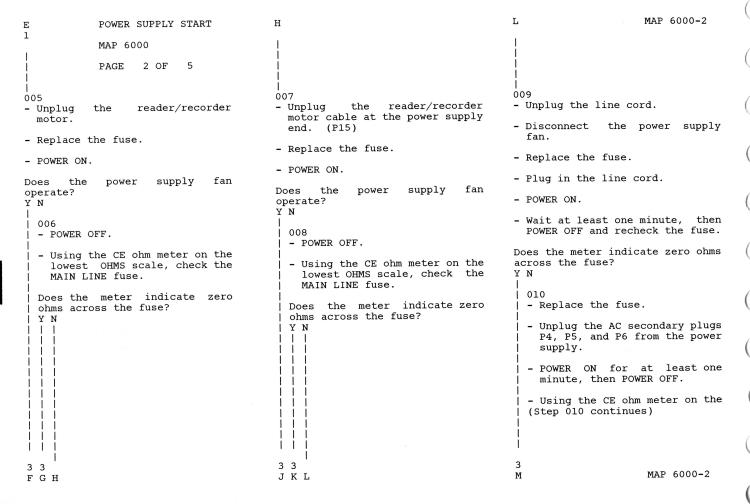
BCDE

MAP 6000-1

002

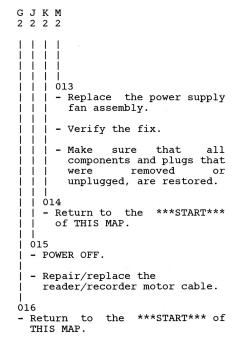
- POWER OFF.

MAIN LINE fuse. (Step 002 continues)



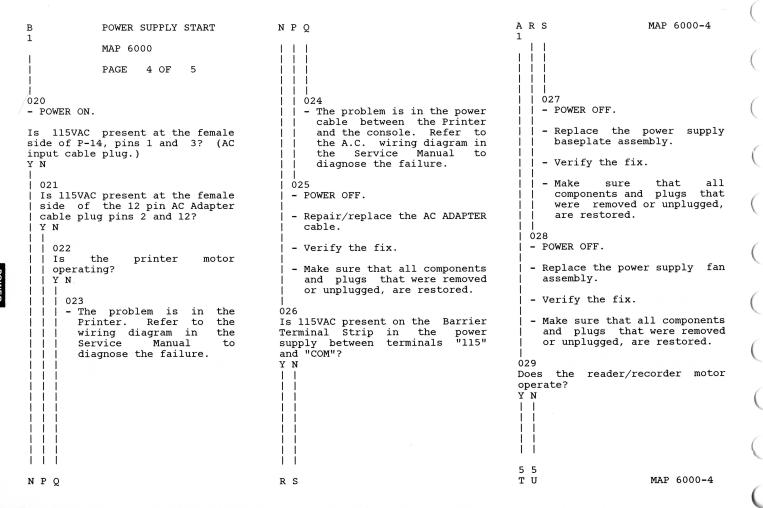
POWER SUPPLY START MAP 6000 PAGE 3 OF 5 (Step 010 continued) lowest OHMS scale, check the MAIN LINE fuse. Does the meter indicate zero ohms across the fuse? Y N 011 - Replace the power supply baseplate assembly. - Verify the fix. - Make sure that all components and plugs that were removed or unplugged, are restored. 012 - Replace the power supply Distribution Board.

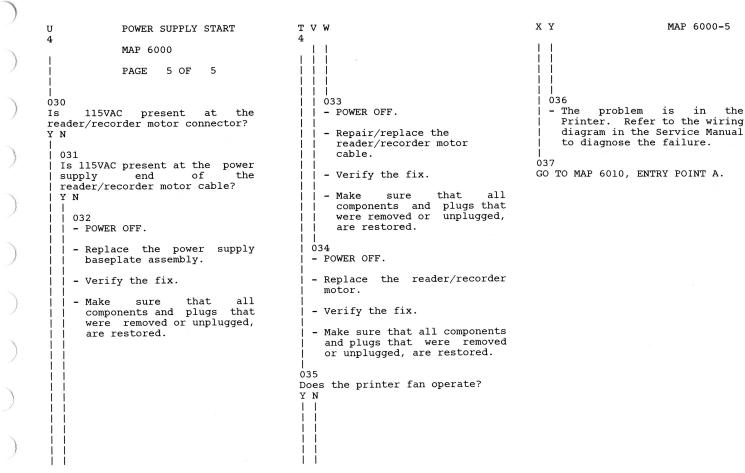
- Verify the fix.
- Make sure that all components and plugs that were removed or unplugged, are restored.



CDF MAP 6000-3 1 1 2 017 - POWER OFF. - Replace the reader/recorder motor. - Verify the fix. - Make that. all sure components and plugs that were removed or unplugged, are restored. 018 - Return to the \*\*\*START\*\*\* of THIS MAP. 019 - A guick change in the line

- voltage or a defective fuse MAY have been the problem.
- Verify the fix.
- Make sure that all components and plugs that were removed or unplugged, are restored.





V W

MAP 6010

PAGE 1 OF 11

FROM	1	ENTER	THIS MAP	
MAP	1	ENTRY	PAGE	STEP
NUMBER		POINT	NUMBER	NUMBER
0010		A	1	001
6000		A	1	001
6030		A	1	001

EXIT POINTS

EXIT TH	IS MAP	TO	
PAGE NUMBER	STEP NUMBER	HAP   MAP   NUMBER	ENTRY POINT
2	005	6020	Α
4	021	6020	Α
4	026	6020	Α
6	040	6020	Α
8	055	6020	Α
3	011	6030	Α
3	012	6030	Α
8	052	6030	Α
9	065	6030	Α
10	068	6030	Α
3	015	6040	Α

- POWER OFF for a minimum of 30 seconds.
- POWER ON. (Step 001 continues)

(Step 001 continued)

Is K1 relay energized? Y N

- 002 - POWER OFF.
- Unplug the P9 connector.
- Wait for a minimum of 30 seconds.
- POWER ON.

Is K1 relay energized? Y N

- 003
- | POWER OFF.
- | Check the D.C. fuses, F9, | F10, F11, F12, F13, and F16 | using the lowest OHM scale | on the CE Meter.

Were any of the fuses found to be defective?

3 3 3 2 A B C D

MAP 6010-1

D POWER SUPPLY MAP 6010 PAGE 2 OF 11 004 - POWER ON. - Is +24VDC present on fuse F9? Y N 005 GO TO MAP 6020, ENTRY POINT A. Y N 006 - POWER OFF. - Jumper P2-15 (or TP-1) to FRAME ground. NOTE: Ιn late level machines, this point is brought out to a point on the regulator board where it can be reached without removing the power supply from the machine, and is marked "TP-1". On early level machines, it will be necessary to POWER the machine OFF, remove the power supply far enough to be able to attach a jumper lead to P2-15, and then power ON the machine with the power supply still out of the machine. Be VERY CAREFUL not (Step 006 continues)

(Step 006 continued) to allow a short to 008 occur between P2-15 and P2-14 or any - Replace the other point. Board. - POWER ON. - Make sure all connectors are replugged. Is K1 relay energized? - Remove any jumpers that were required. 007 - Verify the fix. - POWER OFF. - It WILL be necessary at this 009 - Replace the Regulator Board. time, to remove the power supply from the machine, far - Make sure all connectors are enough to reach P2-14. replugged. - Using the proper OHM scale, the - Remove any jumpers that were measure resistance required. fuse between F9, and connector P2-14. - Verify the fix. Does the resistance measure 010 between 400 and 600 Ohms? Y N - After ensuring that the jumper to keep the K1 relay energized is still in place, Return to the \*\*\*START\*\*\* of THIS MAP.

EFG

MAP 6010-2

Distribution

A B C POWER SUPPLY		J MAP 6010-3
1 1 1 MAP 6010		
	(Step 013 continued) +5.5 P9-11	016
	+5V +4.9 to P9-4 (Sense) +5.5	<ul><li>POWER OFF.</li><li>Check the D.C. fuses, F9, F10,</li></ul>
	-12V -10.7 to P10-1 -13.6	<pre>F11, F12, F13, and F16 using the lowest OHM scale on the CE Meter.</pre>
GO TO MAP 6030, ENTRY POINT A.   013	-5V -4.5 to P9-8 -5.7 P9-12	Were any of the fuses found to be defective?
- Using the following table, check all the voltages on P9 with reference to FRAME ground.  - Record the results of these checks for later use in the MAPS.  NAME TOLERANCE PLUG-PIN	Are ALL of the voltages present, and within tolerance? Y N      014   Is ANY voltage missing? (Less   than half the expected reading)   Y N        015   GO TO MAP 6040,	Is +24VDC present on P9-1, and
+12V +10.8 to P9-3 +13.6		
+9V(R) +8.4 to P9-2 +9.6 P9-6		- Verify the fix.
+5V(R) +4.9 to P9-10 (Step 013 continues)		
	1   0 H J	1 0 4 K L MAP 6010-3

```
L
           POWER SUPPLY
           MAP 6010
                 4 OF 11
           PAGE
                                      024
019
                                      Is +9VDC present on P9-2 **OR**
Is +12VDC present on P9-3 ?
                                      P9-6?
                                      Y N
  020
  Is +12VDC present on fuse F10?
                                        025
                                        Is -24VDC present on fuse F12?
  Y N
                                        Y N
  1 021
                                        1 026
  I GO TO MAP 6020,
                                        I GO TO MAP 6020,
  | ENTRY POINT A.
                                        | ENTRY POINT A.
  022
  - Replace
               the Distribution
                                        027
                                        - POWER OFF.
   Board.
  - Make sure all connectors are
                                        - Using the **LOWEST** ohms
                                          scale (or the 2K ohm/diode
   replugged.
                                          scale of the CE
                                                                Digital
  - Remove any jumpers that were
                                          Meter),
                                                       measure
                                          resistance between each of
    required.
                                          the following pins on the P7
                                                         (With
  - Verify the fix.
                                          connector:
                                          connector unplugged.)
023
Is +9VDC present on P9-2 **AND**
                                        RED LEAD (+) BLACK LEAD (-)
P9-6?
                                              P7-1 -- P7-2
Y N
                                              P7-3 -- P7-2
                                              P7-1 -- P7-3
                                        (Step 027 continues)
M N
```

```
MAP 6010-6
           POWER SUPPLY
                                       MР
                                       4 4
           MAP 6010
           PAGE
                  6 OF 11
                                           (Step 035 continued)
                                                                              039
033
                                           - Remove any jumpers
                                                                    that
                                                                              Is +9VDC present between the fuse
Is +12VDC present on connector
                                                                              F16 (Red + Lead) and D14 Anode?
                                             were required.
P1-11?
                                                                              (The Black - Lead can be attached
Y N
                                                                              to the exposed screw thread on
                                           - Verify the fix.
                                                                              D14.)
 034
                                                                              Y N
                    Distribution
                                         036
 - Replace
              the
                                                            Distribution
                                          - Replace
                                                       the
   Board.
                                                                                040
                                           Board.
                                                                                GO TO MAP 6020, ENTRY POINT A.
 - Make sure all connectors are
                                         - Make sure all connectors are
   replugged.
                                                                              041
                                           replugged.
                                                                              - POWER OFF.
 - Remove any jumpers that were
                                         - Remove any jumpers that were
   required.
                                                                              - Using the **LOWEST** ohms scale
                                           required.
                                                                                (or the 2K ohm/diode scale of
 - Verify the fix.
                                                                                the CE Digital Meter), measure
                                         - Verify the fix.
                                                                                the resistance between each of
035
                                                                                the following pins on the P7
                                        037
- The
       Regulator Board OR
                                        Is +5VDC present on P9-10 **AND**
                                                                                connector: (With the connector
  Distribution
                    Board
                              is
                                                                                unplugged.)
                                        P9-11?
  defective.
                                        Y N
                                                                              RED LEAD (+) BLACK LEAD (-)
- Get BOTH the Regulator and the
                                         038
  Distribution Board, but DO NOT
  replace the Distribution board
                                                    present on P9-10
                                                                                    P7-1 -- P7-2
                                         Is
                                              +5VDC
                                                                                    P7-3 -- P7-2
        the Regulator Board
                                         **OR** P9-11?
  unless
                                                                                    P7-1 -- P7-3
  fails to fix the problem.
                                         Y N
                                                                                    P7-3 -- P7-1
                                                                                    P7-5 -- P7-4
- Make sure all connectors are
                                                                                    P7-5 -- P7-6
  replugged.
                                                                              (Step 041 continues)
(Step 035 continues)
                                                                                                   MAP 6010-6
                                        UVW
```

MAP 6010

7 OF 11 PAGE

(Step 041 continued) P7-6 -- P7-5

P7-6 -- P7-4

Do ALL the resistances measured indicate infinite resistance? Y N

042

- Replace the Heat Sink Assembly.
- Make sure all connectors are replugged.
- Remove any jumpers that were required.
- Verify the fix.

043

- Using the \*\*LOWEST\*\* ohms scale (or the 2K ohm/diode scale of the CE Digital Meter), measure the resistance between each of the following pins on the P7 connector: (With the connector unplugged.)

RED LEAD (+) BLACK LEAD (-) (Step 043 continues)

(Step 043 continued) P7-2 --- P7-1

P7-2 --- P7-3 P7-4 --- P7-5 P7-4 --- P7-6

Do ALL the resistances measured indicate between 15 and 25 OHMS (400-800 ohms on the CE Digital Meter)? Y N

044

- Replace the Heat Sink Assembly.
- Make sure all connectors are replugged.
- Remove any jumpers that were required.
- Verify the fix.

045 - The Regulator Board OR the Distribution Board defective.

- Get BOTH the Regulator and the Distribution Board, but NOT replace Distribution board unless the Regulator Board fails to fix the problem.
- Make sure all connectors are replugged.
- Remove any jumpers that were required.
- Verify the fix.

046

V X

- Replace the Distribution Board.
- Make sure all connectors are replugged.
- Remove any jumpers that were required.
- Verify the fix.

```
MAP 6010-9
                                                                             A A
           POWER SUPPLY
A A
                                                                             F G
C D
88
           MAP 6010
           PAGE
                  9 OF 11
                                                                                 (Step 064 continued)
                                       (Step 061 continued)
                                                                                   the problem.
 058
                     Distribution
                                       Is -5VDC present on P1-1?
             the

    Replace

                                                                                 - Make sure all connectors
   Board.
                                       Y N
                                                                                   are replugged.
 - Make sure all connectors are
                                         062
                                                                                 - Remove any jumpers
                                                                                                          that
                                         Is -24VDC present on P1-15?
   replugged.
                                                                                   were required.
                                         Y N
 - Remove any jumpers that were
                                                                                 - Verify the fix.
   required.
                                           063
                                           - Replace the
                                                            Distribution
                                                                               065
 - Verify the fix.
                                             Board.
                                                                               GO TO MAP 6030, ENTRY POINT A.
                                            - Make sure all connectors
059
                                                                              066
                                             are replugged.
Is -5VDC present on P9-8
                              OR
                                                                             - Replace the Distribution Board.
P9-12?
                                           - Remove any jumpers that
ΥN
                                                                             - Make sure all connectors are
                                             were required.
                                                                                replugged.
 060
 Is -5VDC present on P1-1?
                                           - Verify the fix.
                                                                                           jumpers that were
                                                                              - Remove any
 Y N
                                                                                required.
                                          064
   061
                                          - The Regulator Board OR the
                                                                              - Verify the fix.
   - POWER OFF.
                                            Distribution
                                                            Board
                                                                      is
                                            defective.
   - Unplug the P9 connector.
                                          - Get BOTH the Regulator and
                                            the Distribution Board, but
   - POWER ON.
   (Step 061 continues)
                                            DO
                                                 NOT
                                                         replace
                                                                      the
                                           Distribution board unless the
                                            Regulator Board fails to fix
                                          (Step 064 continues)
A A
                                                                                                   MAP 6010-9
                                        G
```

H K A POWER SUPPLY 3 3 E MAP 6010 PAGE 10 OF 11 (Step 069 continued) 067 - Replace the Distribution Do all of the resistance readings Board. indicate zero ohms? Y N - Make sure all connectors are replugged. 070 Distribution - Replace the - Remove any jumpers that Board. were required. - Make sure all connectors are - Verify the fix. replugged. 068 - Remove any jumpers that were - Unplug the P9 connector. required. GO TO MAP 6030, ENTRY POINT A. - Verify the fix. 069 - POWER OFF. 071 Was it necessary to jumper TP-1 - Using the \*\*LOWEST\*\* OHM scale, (P2-15) to FRAME ground in a measure the resistance between previous step? the following points and FRAME Y N GROUND. 072 P9-5 P9-7 P9-9 Is this MAP being used P9-14 P1-3 diagnose a problem of a missing (Step 069 continues) voltage on the Base Planar power connector? Y N 1 1 1 1 AAA

нјк

K 073 - All the diagnostic procedures indicate that the Power Supply is functioning properly at this time. If a problem is still indicated to be in the Power Supply, it may be necessary to use an oscilloscope to ensure that the power supply produces a constant D.C. voltage (no "ripple"). If an oscilloscope is not available, or the problem is a repeat call, it may be necessary to get ALL the modules for the power supply. and replace them in sequence. If this is necessary, suggested order of replacement is,

MAP 6010-10

Α

- Regulator Card AND Heat Sink Assembly.
- 2. Distribution Board.
- 3. Baseplate Assembly.

- Make sure all connectors are replugged.
- Remove any jumpers that were required.
- Verify the fix.

MAP 6010-11

Power Supply A.C. Checks

PAGE 1 OF 2

ENTRY POINTS
-----FROM | ENTER THIS MAP

MAP | ENTRY PAGE STEP NUMBER | POINT NUMBER NUMBER 6010 | A 1 001

- POWER OFF.
- Unplug P9 .
- Remove the power supply from the machine.
- Unplug P4, P5, and P6.
- POWER ON.
- Check the A.C. output from the transformer secondary windings for the following voltages:

P4-1 to P4-2 = 13VAC (Step 001 continues)

(Step 001 continued) P4-2 to P4-3 = 13VAC P4-1 to P4-3 = 26VAC

P5-1 to P5-2 = 13VAC P5-2 to P5-3 = 13VAC P5-1 to P5-3 = 26VAC

P6-1 to P6-2 = 10VAC P6-2 to P6-3 = 10VAC P6-1 to P6-3 = 20VAC

- The above voltages should be within the following tolerances.

10VAC plus or minus 1.5VAC 13VAC plus or minus 2.0VAC 20VAC plus or minus 3.0VAC 26VAC plus or minus 4.0VAC

Are any of the voltages missing or out of tolerance?

Y N

002 - POWER OFF.

- Replug P4, P5, and P6.

- Remove the AC fuses, F1, F2, F3, F4, F7, and F8, one at a time, and using the lowest OHM scale, check each fuse.

Were any of the fuses found to be defective?
Y N

003
- Replace the Distribution Board.

- Verify the fix.

004

- Replace the defective fuse(s).
- POWER ON.
- Wait at least one minute.
- POWER OFF.
- using the lowest OHM scale, (Step 004 continues)

2 A B

MAP 6020-1

| - Verify the fix. | 006

- Replace the Distribution Board.

- Verify the fix.

007 - Replace the Baseplate Assembly.

- Verify the fix.

MAP 6020-2

MAP 6030-1

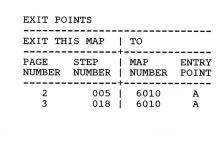
FROM	ENTER	THIS MAP	
MAP NUMBER	ENTRY   POINT	PAGE NUMBER	
6010 6040	A   A	1	001 001
****** - Unplu	POINT A) *****STA Ig the the Base	RT***** cable	****** connectors
	ice any f found de		t may have
- POWER	ON.		
Is Klr Y N	elay ene	rgized?	

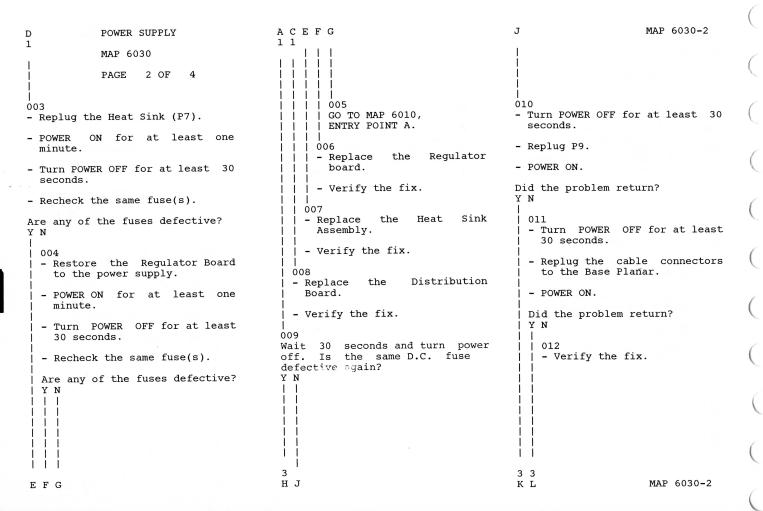
POWER SUPPLY

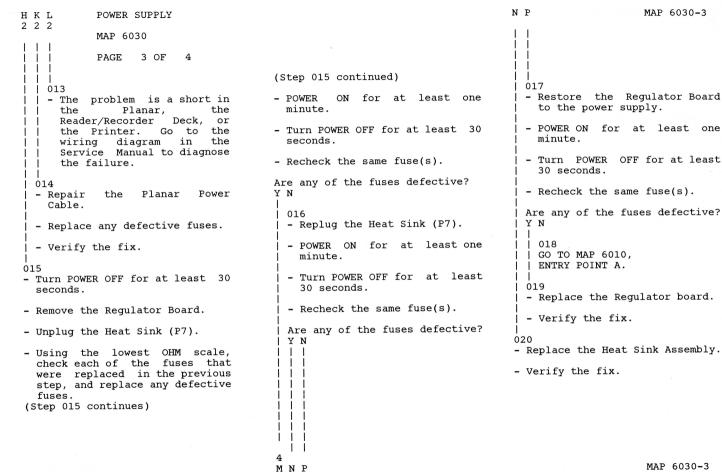
1 OF

MAP 6030 PAGE 1

АВ







M POWER SUPPLY
3 MAP 6030

| PAGE 4 OF 4

|
021
- Replace the Distribution Board.
- Verify the fix.

MAP 6030-4

```
POWER SUPPLY
                                                                                                 MAP 6040-1
D.C.
     TOLERANCE DIAGNOSTICS
PAGE
      1 OF
ENTRY POINTS
                                       EXIT POINTS
                                                                             003
                                                                             Is the +9VDC or +5VDC
                                                                                                       out of
        ENTER THIS MAP
                                                                             tolerance?
                                                                            Y N
MAP
       I ENTRY PAGE
                        STEP
                                       PAGE
                                               STEP
                                                        MAP
                                                                ENTRY
NUMBER | POINT NUMBER
                       NUMBER
                                       NUMBER
                                               NUMBER
                                                        NUMBER
                                                                POINT
                                                                              004
                                                                              - POWER OFF
                                                         6030
                                                                  Α
 6010 L
                          001
                                          3
                                                  014
                                          4
                                                  019 I
                                                         6030
                                                                  Α
                                                                              - Replace the Regulator Board.
                                                                              - Make sure that all components
001
                                                                                 and plugs that were removed
                                                                                 or unplugged, are restored.
(ENTRY POINT A)
*******************
                                                                              - Verify the fix.
- Check fuses F9, F10, F11, F12,
  F13 and F16.
                                                                             005
                                                                             - POWER OFF
             fuses found to be
Were
       anv
defective?
                                                                             - Remove the Regulator Board.
Y N
                                                                             - Unplug the Heat Sink Assembly
  002
                                                                              (P7).
 Is +24VDC, +12VDC, or -12VDC
  out of tolerance?
                                                                             - Using the **LOWEST** OHM scale
 Y N
                                                                               (or the 2K ohm/diode scale of
                                                                              the CE Digital Meter), measure
                                                                              the resistance between each of
                                                                              the following pins on the P7
                                                                              connector: (With the connector
                                                                             (Step 005 continues)
4 3
ABC
```

## POWER SUPPLY TOLERANCE PAGE 3 OF (Step 010 continued) Is the +5VDC Sense (P9-4) within tolerance? Y N 011 - POWER OFF - Remove the Regulator Board. \*\*LOWEST\*\* OHM - Using the scale, measure the resistance FRAME between P1-5 and ground.

Does the resistance measured indicate infinite resistance? Y N

## 012

- the Distribution - Replace Board.
- Make that all sure components and plugs that were removed or unplugged, are restored.
- Verify the fix.

```
GHJ
    013
                        Regulator
    - Replace
                 the
      Board.
    - Make
              sure
                      that
                              all
      components and plugs that
      were removed or unplugged,
      are restored.
    - Verify the fix.
 014
 GO TO MAP 6030, ENTRY POINT A.
015
```

- POWER OFF
- The Regulator Board OR the Distribution Board is defective.
- Get both the Regulator Board AND the Distribution Board, But DO NOT replace the Distribution Board unless the Regulator Board fails to fix the problem.
- Make sure that all components and plugs that were removed or unplugged, are restored. (Step 015 continues)

```
(Step 015 continued)
 - Verify the fix.
016
```

- POWER OFF
- Remove the Power Supply from the machine.

MAP 6040-3

- Wait at least 30 seconds.
- POWER ON.
- Check the A.C. output from the transformer secondary windings for the following voltages:

```
P4-1 to P4-2 = 11.0 to 15.0VAC
P4-2 to P4-3 = 11.0 to 15.0VAC
P4-1 to P4-3 = 22.0 to 30.0VAC
```

P5-1 to P5-2 = 11.0 to 15.0VAC

P5-2 to P5-3 = 11.0 to 15.0VACP5-1 to P5-3 = 22.0 to 30.0VAC P6-1 to P6-2 = 8.5 to 11.5VAC

P6-2 to P6-3 = 8.5 to 11.5VACP6-1 to P6-3 = 17.0 to 23.0VAC (Step 016 continues)

```
TOLERANCE
PAGE 4 OF
```

4

019

GO TO MAP 6030, ENTRY POINT A.

POWER SUPPLY

(Step 016 continued)

Are any voltages missing or out of tolerance? Y N

017
- POWER OFF
- Replace the Distribution

- Make sure that all components and plugs that were removed or unplugged, are restored.
- Verify the fix.

018

- POWER OFF

Board.

- Replace the Baseplate Assembly.
- Make sure that all components and plugs that were removed or unplugged, are restored.
- Verify the fix.



